FM 5-106
EMPLOYMENT OF ATOMIC DEMOLITION MUNITIONS

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HEADQUARTERS, DEPARTMENT OF THE ARMY

Field Manual
No. 5-106

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Employment of Atomic Demolition Munitions

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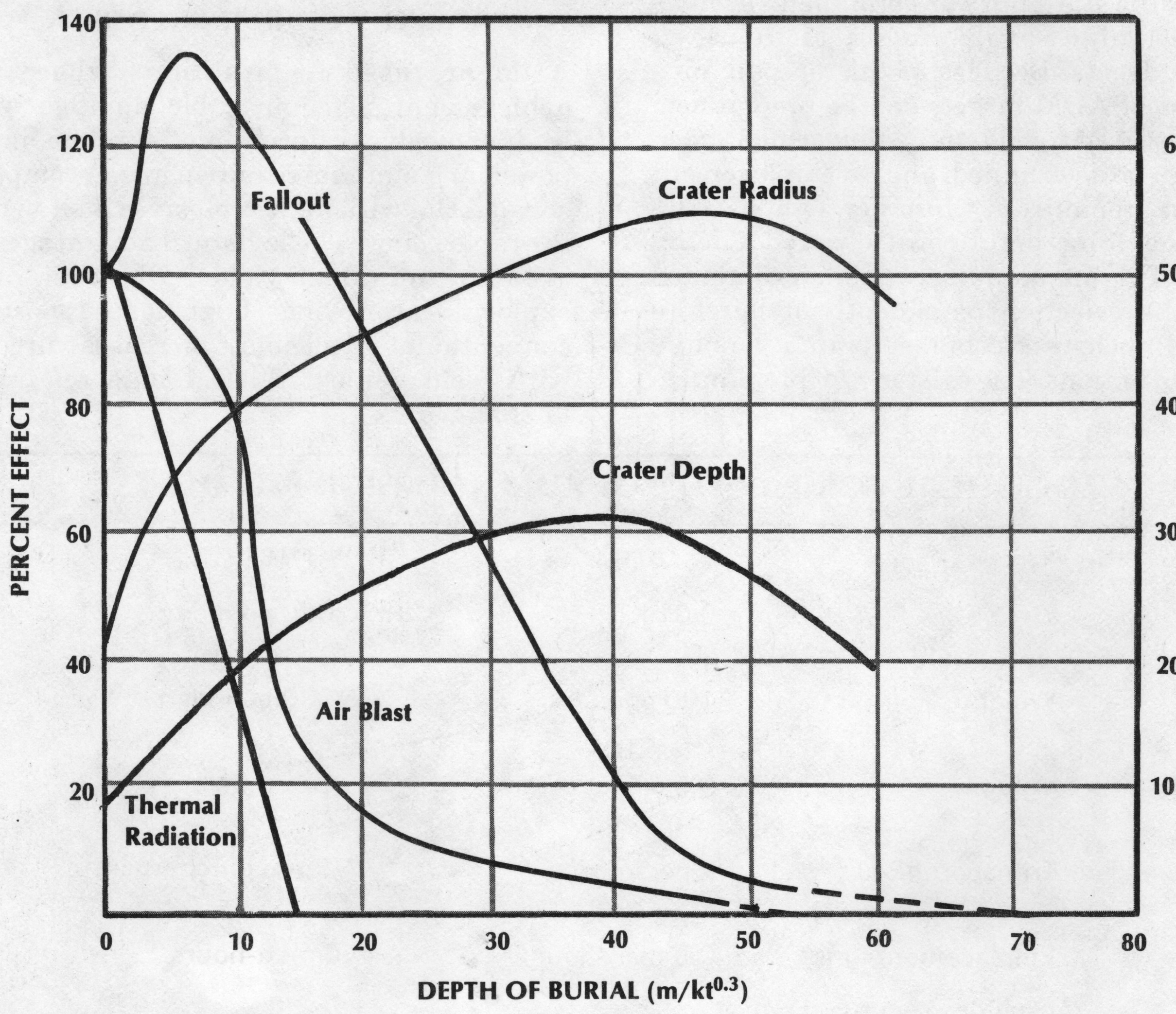
subsurface detonation of a 0.05 KT ADM buried at a depth of 17 meters. This is a reduction of yield by a factor of 20 compared to surface detonation. It is a reduction by more than 1,000 compared to the other nuclear system described.

CONTROL OF UNDESIRABLE EFFECTS

One of the greatest advantages of using ADM is the ability to control nuclear effects. This capability is especially important in ADM employment since ADM are normally used near friendly troops and therefore can create a troop safety hazard. The advantages of control of undesirable effects are apparent in two ways. First, the use of extremely small yields for target destruction reduces undesirable nuclear effects significantly compared to other nuclear methods of destruction. Second, while burial can reduce or eliminate most undesirable nuclear effects, the effectiveness of the cratering action is increased. See figure on page 2-5.

CONTROL OF ADM EFFECTS



Note in the graph on page 2-11 that while air blast, nuclear radiation, and thermal radiation are greatly reduced with increased depth of burst, the primary effect of cratering is maximized. Thus, as a result of the proper selection of depth of burst, the nuclear effects required for target destruction can be optimized while many of the undesirable effects can be reduced. Reduced troop safety distances result, allowing the use of ADM in areas which would otherwise be prohibited to nuclear weapons use. See figure on page 2-13.

ACCURATE TARGET ACQUISITION AND PREPLANNING

ADM are intended for employment against materiel-type targets. Therefore, most targets are stationary or permanent, such as tunnels, highways, bridges, airfields, or supply depots. Because of this specific mission, most ADM targets can be preplanned. The best ADM yield and emplacement position can be determined, and an emplacement hole or demolition chamber can be constructed long before anticipated enemy action. This preplanning capability combined with the selection of a depth of burst to control nuclear effects results in a versatile range of options. The existence of preplanned emplacement holes or demolition chambers also allows rapid and effective ADM emplacement.

DELIVERY MEANS

Unlike other members of the nuclear weapons family, ADM are not limited to specific methods of delivery as are cannon or rocket artillery with limited ranges. ADM can be transported by any of several methods including vehicle, helicopter, and, in the case of the SADM, backpack. In short, ADM may be delivered to any area accessible to foot troops. This advantage of requiring no special delivery equipment adds flexibility to the planning and use of ADM.

ACCOMPLISHMENT OF MISSIONS BEYOND THE CAPABILITY OF HIGH EXPLOSIVES

ADM are used in situations where the achievement of comparable damage with high explosives is prohibited by time, manpower, and material requirements. A comparison of ADM with high explosives is shown in the table below. The logistical advantages of even the minimum-yield ADM over high explosives are obvious. Logistical support for conventional explosives increases directly with yield while for ADM it is relatively unchanged.

LOGISTICAL COMPARISON OF ADM AND HIGH EXPLOSIVES

	ADM	TNT
Yield	0.01 KT	20,000 pounds
Weight	100 pounds	25,000 pounds
Volume	0.5 cubic meters	15 cubic meters
Transportation	2 persons	4 5-ton dump trucks
Emplacement time*	0.5 man-hour	440 man-hours

*Excludes security time

Table C-1 Air Blast Damage Radii Buildings and Structures

Surface Burst Only*

(Distances in Meters)

Target Description	Degree of Damage	Yield (KT) .01	Yield (KT) .05	Yield (KT) .1	Yield (KT) .5	Yield (KT) 1	Yield (KT) 5
Multistory blast resistant reinforced concrete building with reinforced concrete walls. No windows.	MOD SEV	30 23	58 45	81 63	151 117	201 155	479 369
Multistory reinforced concrete building with concrete walls, small window area, three to eight stories.	MOD SEV	44 30	86 58	126 85	247 165	352 235	813 570
Multistory wall-bearing building, brick apartment house type, up to three stories.	MOD SEV	69 54	140 108	207 160	398 307	557 429	1284 988
Multistory wall-bearing building, monumental type, up to four stories.	MOD SEV	43 33	99 76	142 109	276 212	357 298	829 691
Wood frame building, house type, one or two stories.	MOD SEV	92 62	193 129	286 191	555 371	723 517	1643 1238
Light steel frame industrial building. Single story, up to 5-ton crane capacity.	MOD SEV	45 21	91 42	127 59	263 133	339 200	859 553
Heavy steel frame industrial building. Single story, with 25- to 50-ton crane capacity.	MOD SEV	30 18	59 35	83 50	201 124	295 185	765 502
Heavy steel frame industrial building. Single story, with 60- to 100-ton crane capacity.	MOD SEV	26 18	49 33	70 47	172 116	258 173	647 454
Multistory steel frame office type building, 3 to 10 stories, earthquake resistant construction.	MOD SEV	27 18	51 34	72 48	133 90	185 124	436 291
Multistory steel frame office type building, 3 to 10 stories, nonearthquake resistant construction.	MOD SEV	33 21	67 42	93 59	174 110	241 151	576 361
Multistory reinforced concrete frame office type building, 3 to 10 stories, earthquake resistant.	MOD SEV	28 20	56 40	78 56	144 103	194 139	466 334
Multistory reinforced concrete, frame office type building, 3 to 10 stories, nonearthquake resistant.	MOD SEV	34 23	65 44	91 61	168 113	231 154	595 417

*See table C-5 for subsurface burst radii reduction.

MOD - moderate SEV - severe

Table C-2 Air Blast Damage Radii for Bridges

Surface Burst Only*

(Distances in Meters)

Target Description	Degree of Damage	Yield (KT) .01	Yield (KT) .05	Yield (KT) .1	Yield (KT) .5	Yield (KT) 1	Yield (KT) 5
Highway and railroad truss bridges; spans 60-120 meters. Two-lane hwy, dbl trk, open floor and sgl trk ballast floor. Railroad: spans 60-120 meters, sgl trk, open floor, RR: spans 120 meters.	MOD SEV	22 19	46 38	69 58	140 117	200 167	529 442
Highway and railroad girder bridges; spans 23 meters. Two-lane deck and through and four-lane deck, highway. Dbl trk deck, open or ballast floor, or sgl or dbl trk, through, ballast floor, railroad.	MOD SEV	16 15	34 31	49 45	98 89	139 127	354 322
Highway and railroad girder bridges; spans 60 meters. Two-lane through and four-lane deck or through, hwy. Dbl trk deck or through, ballast floor, railroad.	MOD SEV	20 16	42 33	63 49	124 96	176 136	452 348
Highway and railroad girder bridges; spans 60 meters. Two-lane highway. Sgl trk deck or through, ballast floor and dbl trk deck or through, open floor, railroad.	MOD SEV	26 20	56 43	82 63	170 138	230 209	630 573
Floating bridges. U.S. Army standard M2 and M4, random orientation.	MOD SEV	22 17	47 36	69 54	141 109	200 154	521 402

MOD - moderate SEV - severe

Table C-3 Air Blast Damage Radii for Field Fortifications

Surface Burst Only*

(Distances in Meters)

Target Description	Degree of Damage	Yield (KT) .01	Yield (KT) .05	Yield (KT) .1	Yield (KT) .5	Yield (KT) 1	Yield (KT) 5
Command post and personnel shelter, modular sections 6 feet by 8 feet with top 3 feet to 5 feet below ground surface, earth covered, and covered trench entrance.	MOD SEV	18 17	36 34	49 46	93 88	122 115	286 269
Machine gun emplacement, 7 feet by 7 feet, framework extends 2 feet above original ground surface, has open firing ports and open trench entrance, 3 foot to 5 foot mound of earth covers framework and extends down to the ground surface except at openings.							
Firing port facing towards ground zero.	MOD SEV	26 24	53 47	71 64	137 123	179 160	420 377
Firing port facing away from ground zero.	MOD SEV	21 20	42 40	57 54	109 103	142 135	334 316
Unrevetted trenches and foxholes with or without cover.	MOD SEV	42 32	84 65	114 88	218 169	285 221	672 521
Wire entanglements.							
Double apron barbed wire	SEV	24	54	76	161	221	579
Concertina wire	SEV	35	78	111	237	325	852

MOD - moderate SEV - severe

*See table C-5 for subsurface burst radii reduction.

Table C-4 Air Blast Damage Radii for Military Field Equipment

Surface Burst Only*

(Distances in Meters)

Target Description	Degree of Damage	Yield (KT) .01	Yield (KT) .05	Yield (KT) .1	Yield (KT) .5	Yield (KT) 1	Yield (KT) 5
Tracked vehicles	MOD	17	38	54	115	157	411
	SEV	11	24	34	72	98	255
Artillery	MOD	18	39	55	117	160	419
	SEV	16	34	48	102	139	363
Wheeled military vehicles	MOD	23	52	74	157	215	563
	SEV	16	35	50	106	145	379
Supply dumps	SEV	11	23	33	68	93	243
Radios and elec fire control equip	SEV	22	49	70	148	203	531
Open grid radar antennas	SEV	54	122	173	370	508	1332
Railroad rolling stock							
End-on orientation	MOD	33	67	91	174	228	535
	SEV	31	62	84	161	211	496
45 degree orientation	MOD	28	62	87	186	255	667
	SEV	19	42	59	125	171	447
Side-on orientation	MOD	32	72	102	217	298	779
	SEV	26	58	82	175	240	627
Railroad locomotives							
End-on orientation	MOD	24	48	65	125	164	384
	SEV	15	30	41	77	101	237
45 degree orientation	MOD	22	48	68	144	197	515
	SEV	11	25	35	73	100	259
Side-on orientation	MOD	22	49	69	146	200	528
	SEV	13	28	39	82	112	291
Engineer heavy equipment							
Open	MOD	31	69	99	210	289	755
	SEV	20	43	62	130	179	467
Shielded	MOD	18	40	56	119	164	427
	SEV	16	35	49	104	142	371
Parked combat aircraft (random orientation)							
Jet fighter aircraft	MOD	26	53	71	137	179	420
	SEV	21	42	57	109	142	334
Jet bomber aircraft	MOD	50	100	136	262	343	808
	SEV	45	90	122	234	307	722
Prop transport aircraft	MOD	55	112	152	292	383	902
	SEV	50	100	136	262	343	806
Helicopter aircraft	MOD	66	134	182	350	459	1082
	SEV	58	118	161	308	404	952

MOD - moderate SEV - severe

*See table C-5 for subsurface burst radii reduction.

Table C-10 Tunnel Demolition Tables

Severe Damage

Minimum yield (KT) ADM required to extend severe damage for 30 meters within a tunnel through a hard rock medium

(Considered destroyed, requires standard tunneling procedures)

BTD (meters)	Depth of Burst (Meters) 0	1	2	3	4	5	6	7	8	10	15
15	0.50	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
25	5.00	0.50	0.50	0.10	0.10	0.05	0.05	0.05	0.05	0.05	0.05

Table C-17 Radius of Fire Areas for Surface and SubSurface Bursts

(Distances in Meters)

50 Percent Relative Humidity

Yield (KT)	DOB (Meters)	Dry Forest	Green Forest	Wholesale Business Buildings	Retail Business Buildings	Poor Urban Homes	Medium Urban Homes
.01	0	12	75	40	35	45	40
	3	3	20	10	10	10	10
	5	0	0	0	0	0	0
	10	0	0	0	0	0	0
	15	0	0	0	0	0	0
.05	0	250	155	80	70	90	80
	3	135	80	45	40	50	40
	5	55	35	20	15	20	15
	10	0	0	0	0	0	0
	15	0	0	0	0	0	0
.10	0	345	210	110	100	120	105
	3	215	130	70	60	75	65
	5	125	75	40	35	45	40
	10	0	0	0	0	0	0
	15	0	0	0	0	0	0
.50	0	760	440	230	200	255	220
	3	575	335	175	155	195	165
	5	455	265	140	120	155	130
	10	155	90	45	40	50	45
	15	0	0	0	0	0	0
1.00	0	1065	630	315	280	350	300
	5	720	425	215	190	240	205
	10	375	220	110	100	125	105
	15	30	15	10	10	10	10
	20	0	0	0	0	0	0
	25	0	0	0	0	0	0
	30	0	0	0	0	0	0
5.00	0	2330	1490	770	675	860	735
	5	1860	1190	615	540	685	585
	10	1390	890	460	400	510	435
	15	920	590	305	265	340	290
	20	450	285	150	130	165	140
	25	0	0	0	0	0	0
	30	0	0	0	0	0	0

Table C-15 Radius of Detonation for Various Mines

(Distances in Meters)

For Surface Burst*

Mine Type	Yield (KT)	Yield (KT)	Yield (KT)	Yield (KT)	Yield (KT)	Yield (KT)
	.01	.05	.1	.5	1	5
A/T	45	91	124	237	311	731
A/P	137	279	379	730	958	2259

* See Table C-5 for subsurface burst reduction distances.

However, do not decrease the distance below 1.25 times the apparent crater radius.

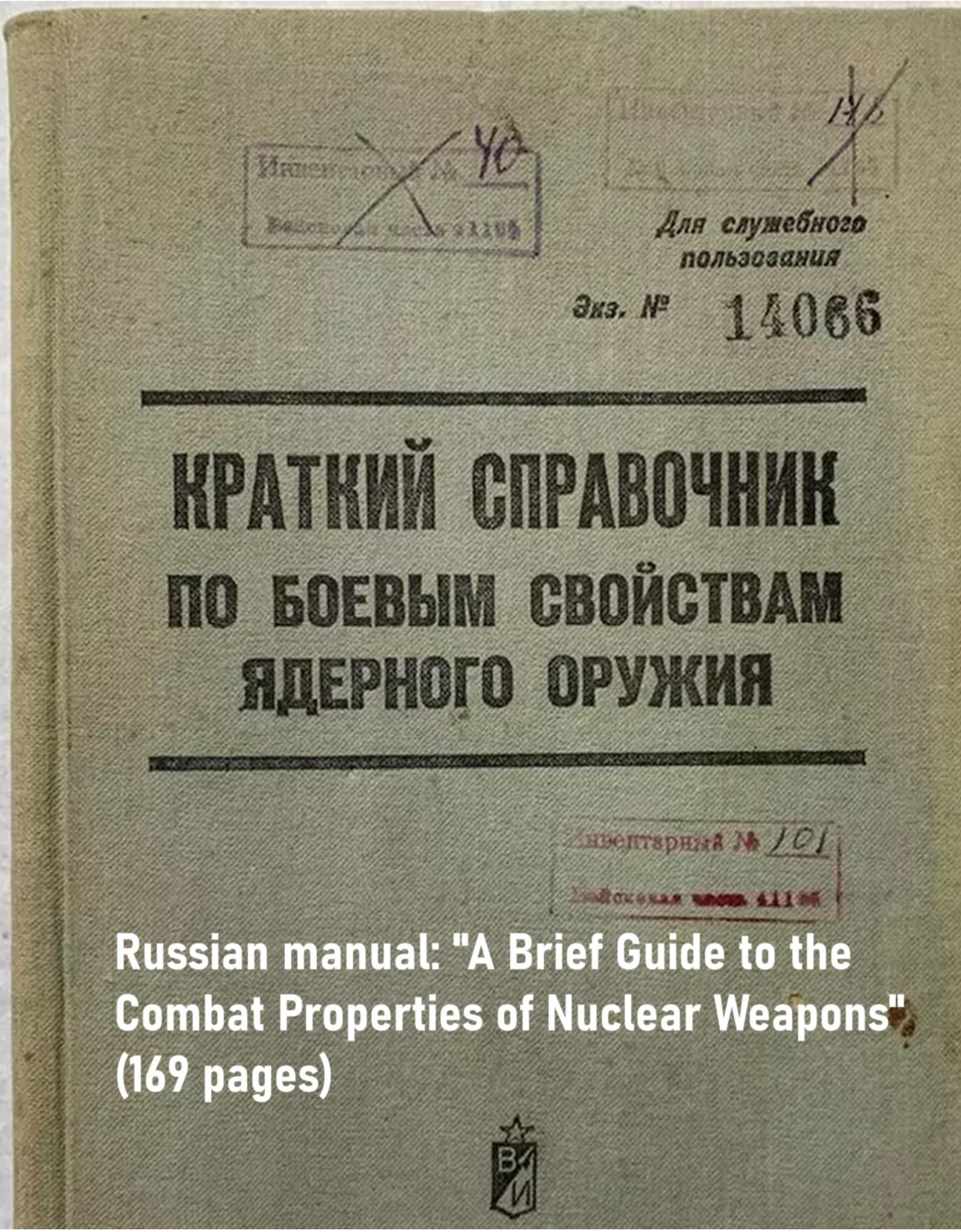
Table C-16 Radii of Tree Blowdown Obstacle

For Surface Burst*

(Distance in Meters)

Type of Tree	Yield (KT)	Yield (KT)	Yield (KT)	Yield (KY)	Yield (KT)	Yield (KT)
	.01	.05	.1	.5	1	5
Deciduous	63	175	223	429	556	1063
Coniferous	63	89	144	300	397	796

* See Table C-5 for subsurface burst reduction distances.



Russian manual: "A Brief Guide to the Combat Properties of Nuclear Weapons" (169 pages)

Таблица 23

Радиусы зон, *км*, в которых на антеннах высотой более 10 *м* и воздушных линиях связи при наземных и низких воздушных ядерных взрывах наводится напряжение, превышающее 10 и 50 *кв*

Radii in km for EMP in 10m antennas

Nuclear yield Мощность взрыва, тыс. *т* kilotons	Наводимое напряжение, *кв* Induced voltage, kV	
	10	50
1	2	1
10	2,5	1,3
100	3	1,5
1000	3,3	1,7

(Surface and low air bursts)

Таблица 24

Радиусы зон, *км*, в которых между жилой подземной неэкранированной кабельной линии длиной более 1 *км* и землей при наземных и низких воздушных ядерных взрывах наводится напряжение, превышающее 10 и 50 *кв*

Nuclear yield Мощность взрыва, тыс. *т* kilotons	Наводимое напряжение, *кв* Induced voltage, kV	
	10	50
1	1,1	0,4
10	1,6	0,6
100	2	0,7
1000	2,4	0,9

EMP in >1 km long underground unshielded residential power cables

КРАТКИЙ СПРАВОЧНИК ПО БОЕВЫМ СВОЙСТВАН ЯДЕРНОГО ОРУЖИЯ (A Brief Guide to the Combat Properties of Nuclear Weapons), 2nd edition, Secret, Chapter 5: Electromagnetic Pulse, p71, tables 23 and 24.

Таблица 23

Радиусы зон, *км*, в которых на антеннах высотой более 10 *м* и воздушных линиях связи при наземных и низких воздушных ядерных взрывах наводится напряжение, превышающее 10 и 50 *кв*

Мощность взрыва, тыс. *т*	Наводимое напряжение, *кв*	
	10	50
1	2	1
10	2,5	1,3
100	3	1,5
1000	3,3	1,7

Таблица 24

Радиусы зон, *км*, в которых между жилой подземной неэкранированной кабельной линии длиной более 1 *км* и землей при наземных и низких воздушных ядерных взрывах наводится напряжение, превышающее 10 и 50 *кв*

Мощность взрыва, тыс. *т*	Наводимое напряжение, *кв*	
	10	50
1	1,1	0,4
10	1,6	0,6
100	2	0,7
1000	2,4	0,9

Table 23

Radii of zones, km, in which
a voltage exceeding 10 and 50 kV is induced on antennas with a height of more
than 10 m and overhead communication
lines during ground and low
-altitude nuclear explosions

Explosion power, thousand tons	Induced voltage, kv	
	10	50
1	2	1
10	2,5	1,3
100	3	1,5
1000	3,3	1,7

Table 24

Radii of zones,
km, in which
a voltage exceeding 10 and 50 kV is induced between
a residential underground unshielded
cable line with a length of more
than 1 km and the ground during
ground and low
air nuclear explosions

Explosion power, thousand tons	Induced voltage, kv	
	10	50
1	1,1	0,4
10	1,6	0,6
100	2	0,7
1000	2,4	0,9

Наименование техники, вооружения и сооружений Name of equipment, weapons and structures	Вид взрыва (Н — наземный, В — воздушный) H = surface burst B = air burst	Destruction pressure Давление, выводящее объект из строя, кг/см² kg/cm2	Мощность взрыва, тыс. т Nuclear yield, kilotons 1	2	3	5	10	20	30	50	100	200	300	500	1000
Бронетанковая и автотракторная техника Military vehicles															
Тяжелые и средние танки Medium and heavy tanks	Н	2—4	0,17	0,21	0,24	0,28	0,36	0,45	0,52	0,61	0,77	0,97	1,1	1,3	1,7
	В	0,9—1,1	0,21	0,27	0,31	0,37	0,46	0,58	0,67	0,79	1	1,25	1,45	1,7	2,1
Легкие танки и самоходные артиллерийские установки Light tanks or SPGs	Н	1,1—1,3	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Бронетранспортеры APCs	Н	1,1—1,3	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	0,4—0,55	0,38	0,48	0,55	0,65	0,82	1,05	1,2	1,4	1,75	2,25	2,55	3	3,8
Грузовые автомобили и автоцистерны Trucks / tank cars	Н	0,4—0,5	0,42	0,53	0,61	0,72	0,9	1,15	1,3	1,55	1,95	2,45	2,8	3,35	4,2
	В	0,25—0,35	0,54	0,68	0,78	0,92	1,15	1,5	1,7	2	2,5	3,15	3,6	4,3	5,4
Автобусы и специальные автомобили с кузовами автобусного типа Buses etc	Н	0,2—0,3	0,6	0,75	0,86	1	1,3	1,6	1,85	2,2	2,8	3,5	4	4,75	6
	В	0,2—0,3	0,63	0,79	0,91	1,1	1,35	1,7	1,95	2,3	2,9	3,7	4,2	5	6,3
Гусеничные артиллерийские тягачи Tracked artillery	Н	0,45—0,55	0,4	0,5	0,57	0,68	0,85	1,1	1,25	1,45	1,85	2,3	2,65	3,15	4
	В	0,25—0,35	0,51	0,64	0,73	0,87	1,1	1,4	1,6	1,9	2,35	3	3,4	4,05	5,1
Гусеничные тракторы Tracked tractors	Н	0,6—0,7	0,34	0,43	0,19	0,58	0,73	0,92	1,05	1,25	1,6	2	2,3	2,7	3,4
	В	0,4—0,5	0,39	0,49	0,56	0,67	0,84	1,05	1,2	1,45	1,8	2,3	2,6	3,1	3,9
Радиолокационная техника и средства связи Radar technology															
Радиолокационные станции типа СОН-4 SON-4 radar	Н	0,35—0,5	0,43	0,54	0,62	0,73	0,93	1,15	1,35	1,6	2	2,5	2,9	3,4	4,3
	В	0,3—0,4	0,5	0,63	0,72	0,85	1,1	1,35	1,55	1,85	2,3	2,9	3,35	4	5
Радиолокационные станции типа П-12М и П-15 P12M and P15 radar	Н	0,15—0,2	0,75	0,95	1,1	1,3	1,6	2	2,35	2,8	3,5	4,4	5	6	7,5
	В	0,15—0,2	0,85	1,1	1,25	1,45	1,85	2,3	2,65	3,15	4	5	5,7	6,75	8,5
Радиолокационные станции типа ПРВ-10 и П-20 PRV10 and P20 radar	Н	0,12—0,18	0,9	1,15	1,3	1,55	1,95	2,45	2,8	3,3	4,2	5,25	6	7,15	9
	В	0,12—0,18	0,96	1,2	1,4	1,65	2,05	2,6	3	3,55	4,45	5,6	6,45	7,6	9,6
Войсковые автомобильные радиостанции (повреждение кузовов и антенных устройств) Military vehicle radios	Н	0,2—0,3	0,6	0,75	0,86	1	1,3	1,6	1,85	2,2	2,8	3,5	4	4,75	6
	В	0,2—0,3	0,63	0,79	0,91	1,1	1,35	1,7	1,95	2,3	2,9	3,7	4,2	5	6,3
Переносные радиостанции Portable radios	Н	1,1—1,3	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Телефонно-телеграфная аппаратура Telephone sets	Н	0,6—0,9	0,32	0,4	0,46	0,55	0,69	0,87	1	1,2	1,5	1,85	2,15	2,55	3,2
	В	0,4—0,6	0,36	0,45	0,52	0,61	0,77	0,97	1,1	1,3	1,65	2,1	2,4	2,85	3,6

Таблица 41

Radius for failure of military equipment, weapons and structures from nuclear explosions, km

Радиусы зон выхода из строя военной техники, вооружения и инженерных сооружений при ядерных взрывах, *км*

Наименование техники, вооружения и сооружений (Name of equipment, weapons or structures)	Вид взрыва (Н — наземный, В — воздушный)	Давление, выводящее объект из строя, $кг/см^2$ (Severe damage pressure, kg/cm2)	Мощность взрыва, тыс. т (Nuclear yield, kilotons) 1	2	3	5	10	20	30	50	100	200	300	500	1000
Ракетная и авиационная техника (Missile and aviation equipment)															
Operational-tactical ballistic missiles. Баллистические ракеты оперативно-тактического назначения	Н	0,25—0,3	0,6	0,75	0,86	1	1,3	1,6	1,85	2,2	2,8	3,5	4	4,75	6
	В	0,2—0,25	0,68	0,86	0,98	1,15	1,45	1,85	2,1	2,5	3,15	4	4,6	5,4	6,8
Cruise missiles and jet fighters. Крылатые ракеты оперативно-тактического назначения и реактивные истребители	Н	0,3—0,35	0,5	0,63	0,72	0,85	1,1	1,35	1,55	1,85	2,3	2,9	3,35	4	5
	В	0,25—0,35	0,54	0,68	0,78	0,92	1,15	1,5	1,7	2	2,5	3,15	3,6	4,3	5,4
Реактивные бомбардировщики и реактивные транспортные самолеты Jet bombers and transport aircraft	Н	0,13—0,15	0,88	1,1	1,25	1,5	1,9	2,4	2,75	3,25	4,1	5,15	5,9	7	8,8
	В	0,13—0,15	1	1,25	1,45	1,7	2,15	2,7	3,1	3,65	4,6	5,8	6,65	7,85	10
Поршневые транспортные самолеты, самолеты связи и вертолеты Piston powered aircraft	Н	0,07—0,08	1,4	1,75	2	2,4	3	3,8	4,35	5,15	6,5	8,2	9,4	11	14
	В	0,07—0,08	1,6	2	2,3	2,75	3,45	4,35	5	5,9	7,4	9,35	10,5	12,5	16
Артиллерийское вооружение, стрелковое оружие и гранатометы (Artillery, small arms, grenade launchers)															
Ground and nuclear artillery guns. Орудия наземной и атомной артиллерии	Н	1,1—1,3	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Орудия зенитной артиллерии Anti-aircraft artillery guns	Н	0,6—0,9	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
	В	0,4—0,6	0,36	0,45	0,52	0,61	0,77	0,97	1,1	1,3	1,65	2,1	2,4	2,85	3,6
Минометы Mortars	Н	1—2	0,23	0,29	0,33	0,39	0,49	0,62	0,7	0,84	1,05	1,35	1,5	1,8	2,3
	В	0,7—0,9	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
Rifles, carbines, autos, light machine guns. Винтовки, карабины, автоматы, ручные пулеметы и ручные гранатометы & grenade launchers	Н	1—1,2	0,26	0,33	0,38	0,45	0,57	0,71	0,82	0,97	1,2	1,55	1,75	2,1	2,6
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Станковые и крупнокалиберные пехотные пулеметы Heavy-duty machine guns	Н	0,5—0,7	0,35	0,44	0,5	0,6	0,75	0,95	1,1	1,3	1,65	2,05	2,35	2,8	3,5
	В	0,4—0,6	0,36	0,45	0,52	0,61	0,77	0,97	1,1	1,3	1,65	2,1	2,4	2,85	3,6
Станковые гранатометы Heavy-duty grenade launchers	Н	0,45—0,55	0,4	0,5	0,57	0,68	0,85	1,1	1,25	1,45	1,85	2,3	2,65	3,15	4
	В	0,3—0,45	0,45	0,57	0,65	0,77	0,97	1,2	1,4	1,6	2,1	2,6	3	3,6	4,5

H= surface burst
B = air burst

Таблица 39

Personnel casualty radii (km)

Средние радиусы зон выхода из строя личного состава при взрывах в районе со средними горами при чистом воздухе, *км*

Personnel location Условия расположения личного состава	Вид взрыва H = surface burst B = air burst	Nuclear yield, kilotons Мощность взрыва, тыс. т: 1	2	3	5	10	20	30	50	100	200	300	500	1000
Outside Вне укрытий, в автомобилях и бронетранспортерах открытого типа open vehicles	Н В	0,86 0,87	0,98 1,05	1,05 1,2	1,2 1,4	1,4 1,7	1,6 2,1	1,8 2,3	2,1 2,7	2,6 3,4	3,5 4,8	4,1 6	5 7,4	6,7 9,7
В открытых фортификационных сооружениях Open fortifications	Н В	0,7 0,7	0,78 0,85	0,83 0,95	0,88 1,1	1 1,4	1,15 1,6	1,25 1,8	1,4 2	1,7 2,4	2,2 3,2	2,6 3,7	3,2 4,6	4,2 6
В бронетранспортерах закрытого типа In closed APCs	Н В	0,86 0,87	0,96 0,98	1 1,05	1,05 1,15	1,2 1,3	1,35 1,45	1,45 1,55	1,6 1,7	1,8 1,9	2 2,1	2,2 2,3	2,45 2,6	2,8 3
В танках In tanks	Н В	0,67 0,67	0,75 0,72	0,8 0,75	0,85 0,8	0,95 0,85	1 0,87	1,05 0,88	1,1 0,9	1,2 0,95	1,3 1,05	1,4 1,1	1,6 1,3	2 1,7
В блиндажах In dugouts	Н В	0,18 0,11	0,23 0,14	0,26 0,17	0,32 0,2	0,4 0,25	0,53 0,32	0,62 0,37	0,75 0,43	1 0,55	1,3 0,7	1,5 0,8	1,8 0,95	2,3 1,2
В убежищах легкого типа Laying down in shelters	Н В	0,14 0,08	0,17 0,1	0,2 0,12	0,23 0,14	0,3 0,18	0,4 0,23	0,46 0,26	0,55 0,31	0,75 0,4	1 0,5	1,2 0,6	1,4 0,7	1,8 0,9

Таблица 38
Table 38

Radii (km) for continuous fire zone in forests in dry weather with average visibility, no snow

Ориентировочные радиусы, *км*, зон возникновения в лесу сплошных низовых пожаров при очень слабой дымке в сухую погоду при отсутствии снежного покрова

Породный состав леса (Type of woods)	Вид взрыва (H = surface burst; B = air burst)	Мощность взрыва, тыс. т (Nuclear yield, kilotons)												
		1	2	3	5	10	20	30	50	100	200	300	500	1000
Хвойный (Coniferous)	Н	—	—	—	—	—	—	—	—	—	—	—	—	—
	В	—	—	—	—	—	—	—	1,8	2,4	3	3,35	4,1	5,2
Смешанный (Mixed)	Н	—	—	—	—	—	—	—	—	—	2,4	2,8	3,4	4,4
	В	0,55	0,7	0,8	1	1,3	1,7	2	2,4	3,2	4	4,7	5,7	7,2
Лиственный (Deciduous)	Н	—	0,5	0,6	0,7	1	1,3	1,5	1,8	2,3	3	3,5	4,2	5,4
	В	0,7	0,8	1	1,15	1,65	1,95	2,25	2,7	3,8	4,45	5,1	6,1	8,7

Примечание. Прочерки означают, что при взрывах данной мощности сплошные низовые пожары не будут наблюдаться вследствие полного уничтожения леса ударной волной в зоне действия светового излучения.

Dashes indicate that blast wave extinguished fires in this area.

Продолжение

Name of equipment, weapons or structures Наименование техники, вооружения и сооружений	Вид взрыва (Н — наземный, В — воздушный) H = surface burst B = air burst	Severe damage pressure, kg/cm2 Давление, выводящее объект из строя, $кг/см^2$	Nuclear yield, kilotons Мощность взрыва, тыс. т 1	2	3	5	10	20	30	50	100	200	300	500	1000
Fortifications, bridges, landing strips for aircraft, wire and minefields, take-off airfields **Фортификационные сооружения, мосты, посадочные полосы проволочные и минные заграждения и взлетно-аэродромов**															
Trenches (open crevices) - no cover Траншеи (открытые щели) полного профиля без одежды крутостей в средних грунтах	Н	0,4—0,8	0,34	0,43	0,49	0,58	0,73	0,92	1,05	1,25	1,6	2	2,3	2,7	3,4
	В	0,4—0,8	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Trenches (open crevices) - clothed Траншеи (открытые щели) полного профиля с одеждой крутостей в средних грунтах	Н	1—1,5	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	1—1,5	0,19	0,24	0,27	0,32	0,4	0,5	0,58	0,68	0,86	1,1	1,25	1,5	1,9
Перекрытые щели Blocked gaps	Н	0,5—1	0,31	0,39	0,44	0,53	0,66	0,84	0,96	1,15	1,45	1,8	2,05	2,45	3,1
	В	0,5—1	0,26	0,33	0,38	0,45	0,57	0,71	0,82	0,97	1,2	1,55	1,75	2,1	2,6
Блиндажи Dugouts	Н	1—2	0,23	0,29	0,33	0,39	0,49	0,62	0,7	0,84	1,05	1,35	1,5	1,8	2,3
	В	1—2	0,17	0,21	0,24	0,28	0,36	0,45	0,52	0,61	0,77	0,97	1,1	1,3	1,7
Убежища легкого типа Light duty shelters	Н	2—3	0,18	0,23	0,26	0,31	0,39	0,49	0,56	0,66	0,83	1,05	1,2	1,45	1,8
	В	2—3	0,13	0,16	0,18	0,22	0,27	0,35	0,4	0,47	0,59	0,74	0,85	1	1,3
Убежища тяжелого типа Heavy duty shelters	Н	5—10	0,11	0,14	0,16	0,2	0,25	0,31	0,35	0,42	0,53	0,67	0,76	0,9	1,1
	В	5—10	0,08	0,1	0,11	0,13	0,17	0,21	0,24	0,29	0,36	0,46	0,52	0,61	0,8
Дерево-земляные огневые и наблюдательные сооружения Observation structures (wood & earth)	Н	1—1,5	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	1—1,5	0,19	0,24	0,27	0,32	0,4	0,5	0,58	0,68	0,86	1,1	1,25	1,5	1,9
Долговременные сооружения Long term facilities	Н	10—20	0,09	0,11	0,13	0,15	0,18	0,24	0,27	0,32	0,4	0,51	0,58	0,69	0,9
	В	10—20	0,06	0,08	0,09	0,1	0,12	0,16	0,19	0,22	0,26	0,35	0,4	0,48	0,6
Наплавные мосты из табельных парков Floating bridges	Н	0,8—1,2	0,27	0,35	0,4	0,47	0,59	0,75	0,85	1	1,25	1,6	1,85	2,2	2,7
	В	0,35—0,4	0,45	0,57	0,65	0,77	0,97	1,2	1,4	1,6	2,1	2,6	3	3,6	4,5
Низководные деревянные мосты Low water wooden sea walls	Н	1,1—1,3	0,25	0,32	0,36	0,43	0,54	0,68	0,78	0,93	1,15	1,45	1,7	2	2,5
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3
Металлические мосты с пролетом длиной 30—45 *м* Metal bridges of 30-45m span	Н	1—2	0,23	0,29	0,33	0,39	0,49	0,62	0,7	0,84	1,05	1,35	1,5	1,8	2,3
	В	0,6—0,7	0,3	0,38	0,43	0,51	0,65	0,81	0,93	1,1	1,4	1,75	2	2,4	3

PAMPHLET No. 39-1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *20 May 1959*

NUCLEAR WEAPONS EMPLOYMENT

*This pamphlet supersedes DA Pam 39-1, 12 June 1956, including C 1, 31 May 1957.

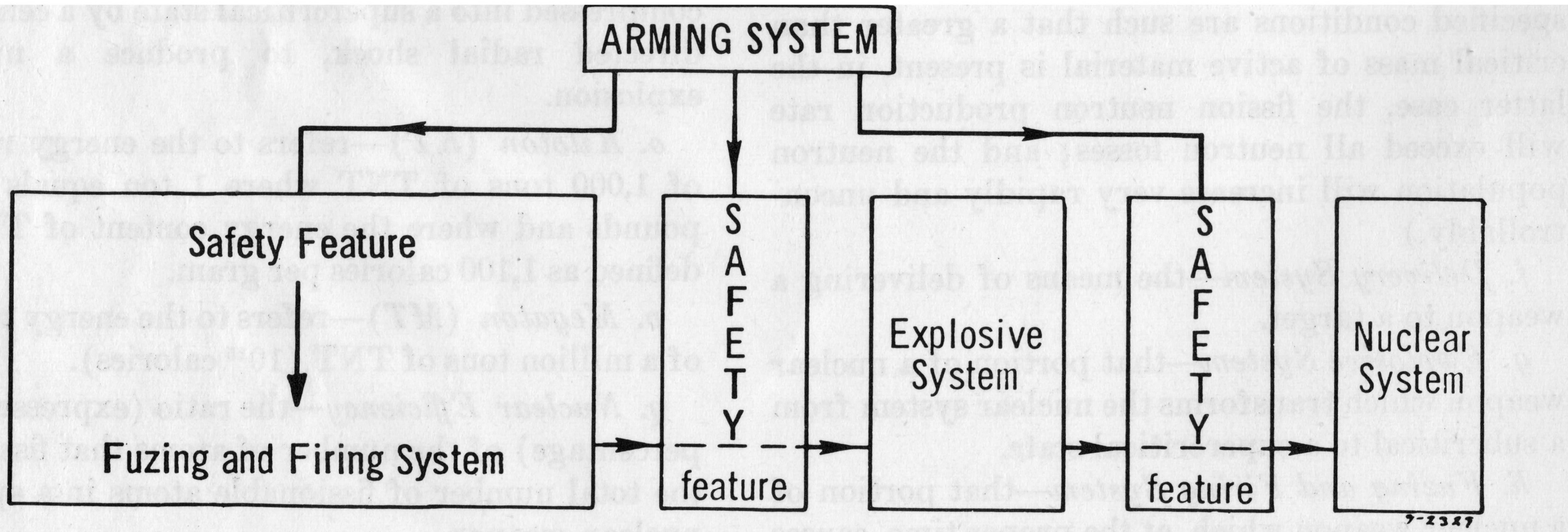


Figure 1.2. Relationship of arming, and the fuzing and firing, explosive, and nuclear systems of a nuclear weapon.

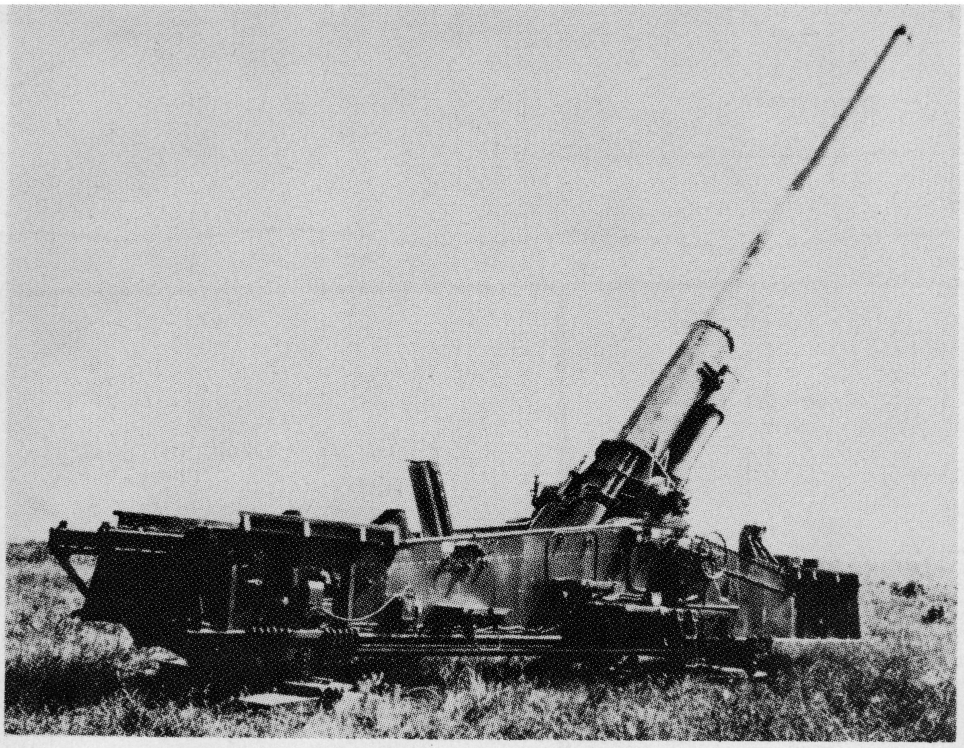


Figure 1.25a. 280-mm gun.

Figure 1.25b. 8-in. howitzer, self-propelled.

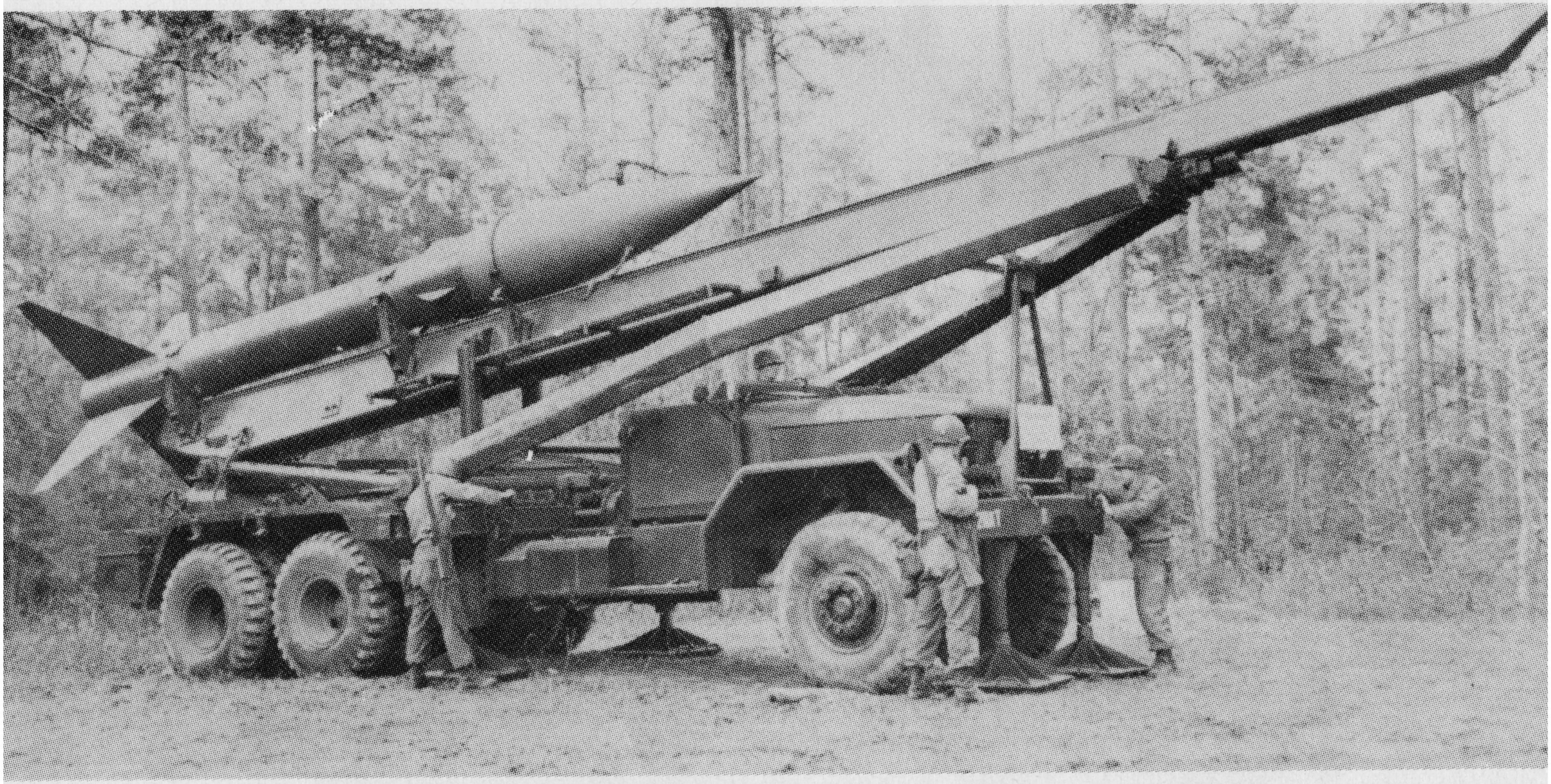
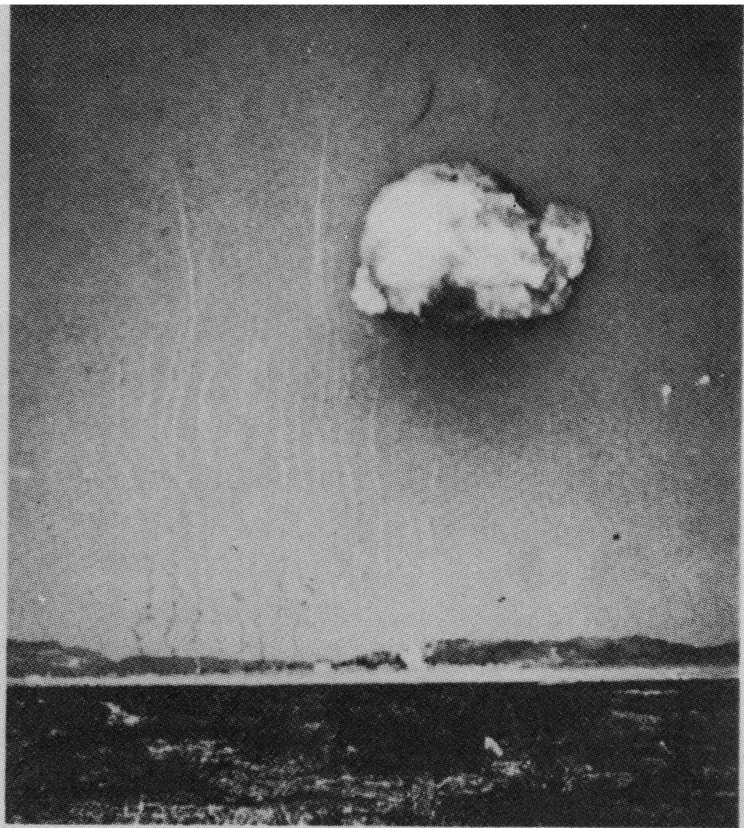


Figure 1.25d. **HONEST JOHN.**



HIGH

LOW

Figure 2.8.—High and low air bursts.

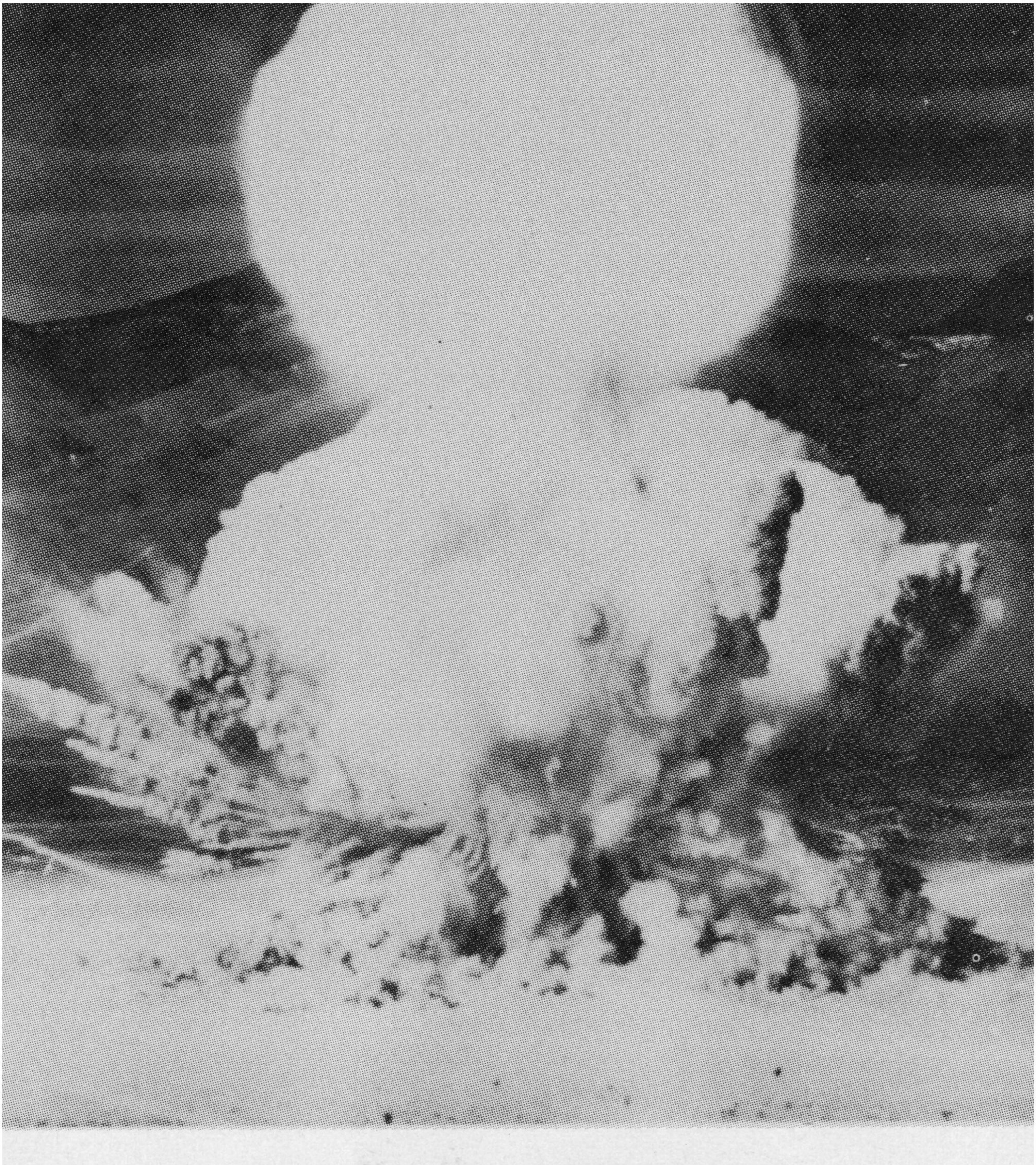
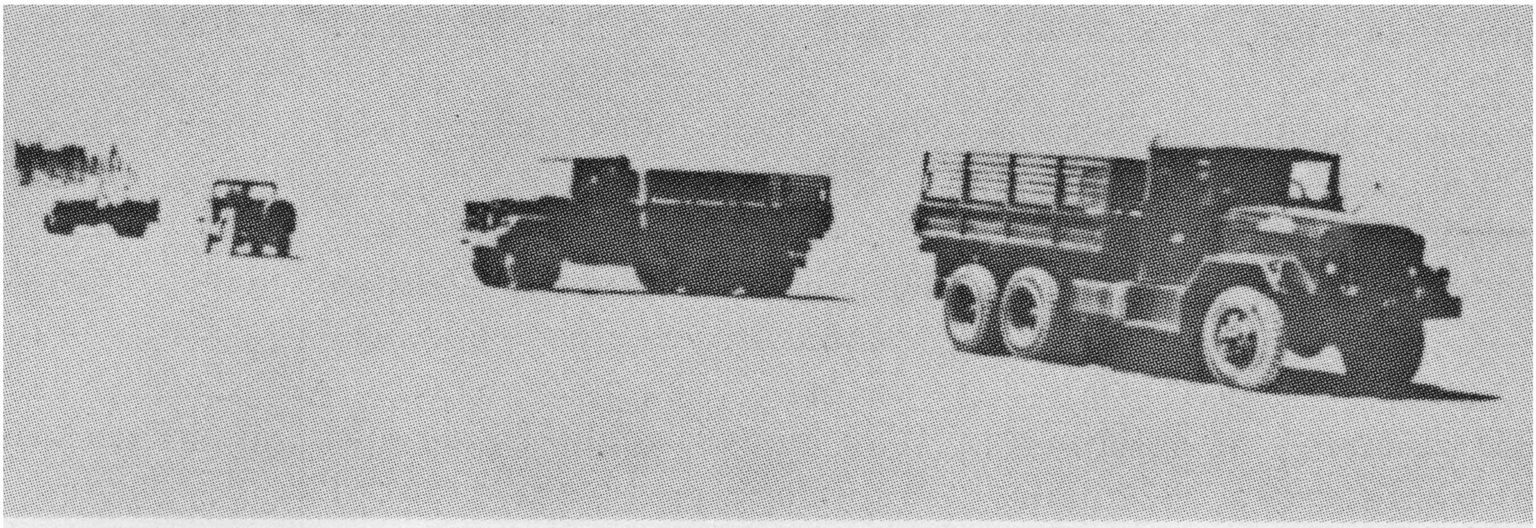


Figure 2.4. Surface burst.



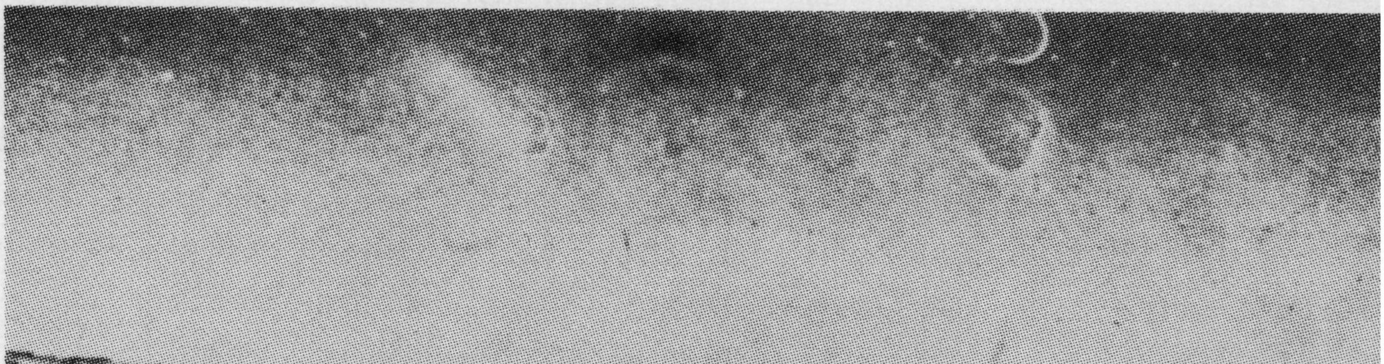


Figure 2.15b. Drag type target.

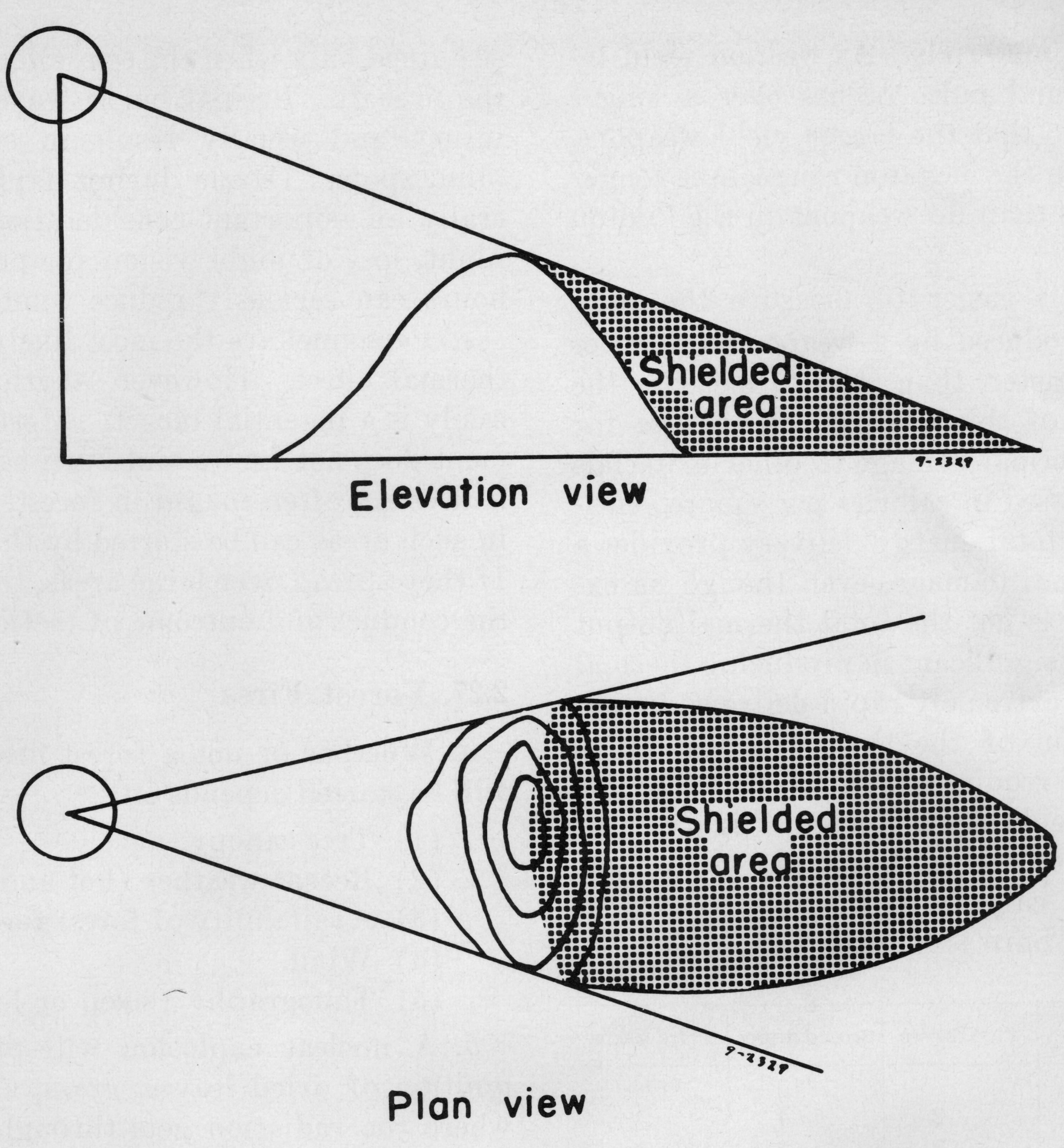


Figure 2.25. Thermal shielding.

Acute dose (roentgens)[1]	Probable effect
0 to 50	No obvious effect except possibly minor blood changes.
80 to 120	Vomiting and nausea for about 1 day in 5 to 10 percent of exposed personnel. Fatigue but no serious disability.
130 to 170	Vomiting and nausea for about 1 day, followed by other symptoms of radiation sickness in about 25 percent of personnel. No deaths anticipated.
180 to 220	Vomiting and nausea for about 1 day, followed by other symptoms of radiation sickness in about 50 percent of personnel. No deaths anticipated.
270 to 330	Vomiting and nausea in nearly all personnel on first day, followed by other symptoms of radiation sickness. About 20 percent deaths within 2 to 6 weeks after exposure; survivors convalescent for 3 months.
400 to 500	Vomiting and nausea in all personnel on first day, followed by other symptoms of radiation sickness. About 50 percent deaths within 1 month; survivors convalescent for about 6 months.
550 to 750	Vomiting and nausea in all personnel within 4 hours from exposure, followed by other symptoms of radiation sickness. Up to 100 percent deaths; few survivors convalescent for about 6 months.
1,000	Vomiting and nausea in all personnel within 1 to 2 hours. Probably no survivors.
5,000	Incapacitation almost immediately. All personnel will be fatalities within 1 week.

[1] And/or rem in the case of neutrons.

Figure 2.39. Probable effects of accute radiation doses.

2.40. Characteristics of Acute Radiation Injury

a. Very large doses of whole body radiation, 5,000 roentgens (rem) or more, result in very rapid injury to the central nervous system. The symptoms are—

(1) Lack of muscular coordination.
(2) Difficulty in breathing.
(3) Intermittent stupor.

There is almost immediate incapacitation, and death is certain within a few hours to a week.

b. Doses of about 700 to 1,000 roentgens (or rem) result in severe injury to the gastro-intestinal system. The symptoms are—

(1) Nausea and vomiting within one to two hours (the larger the dose, the sooner symptoms appear).
(2) Prostration, diarrhea, lack of appetite, and fever.
(3) Internal bleeding, infection, soreness of throat, and loss of hair. The sooner these symptoms develop, the sooner death is likely to result. Although there is no pain during the first few days, patients experience feelings of discomfort, depression, and body fatigue. In some cases the initial severe sickness disappears and is followed by a so-called *latent period*, during which the patient appears to be free of symptoms. This period, when it occurs, is followed by severe sickness, delirium or coma, and death within one to two weeks.

ENTRY TIME—STAY TIME—TOTAL DOSE FALLOUT RADIATION

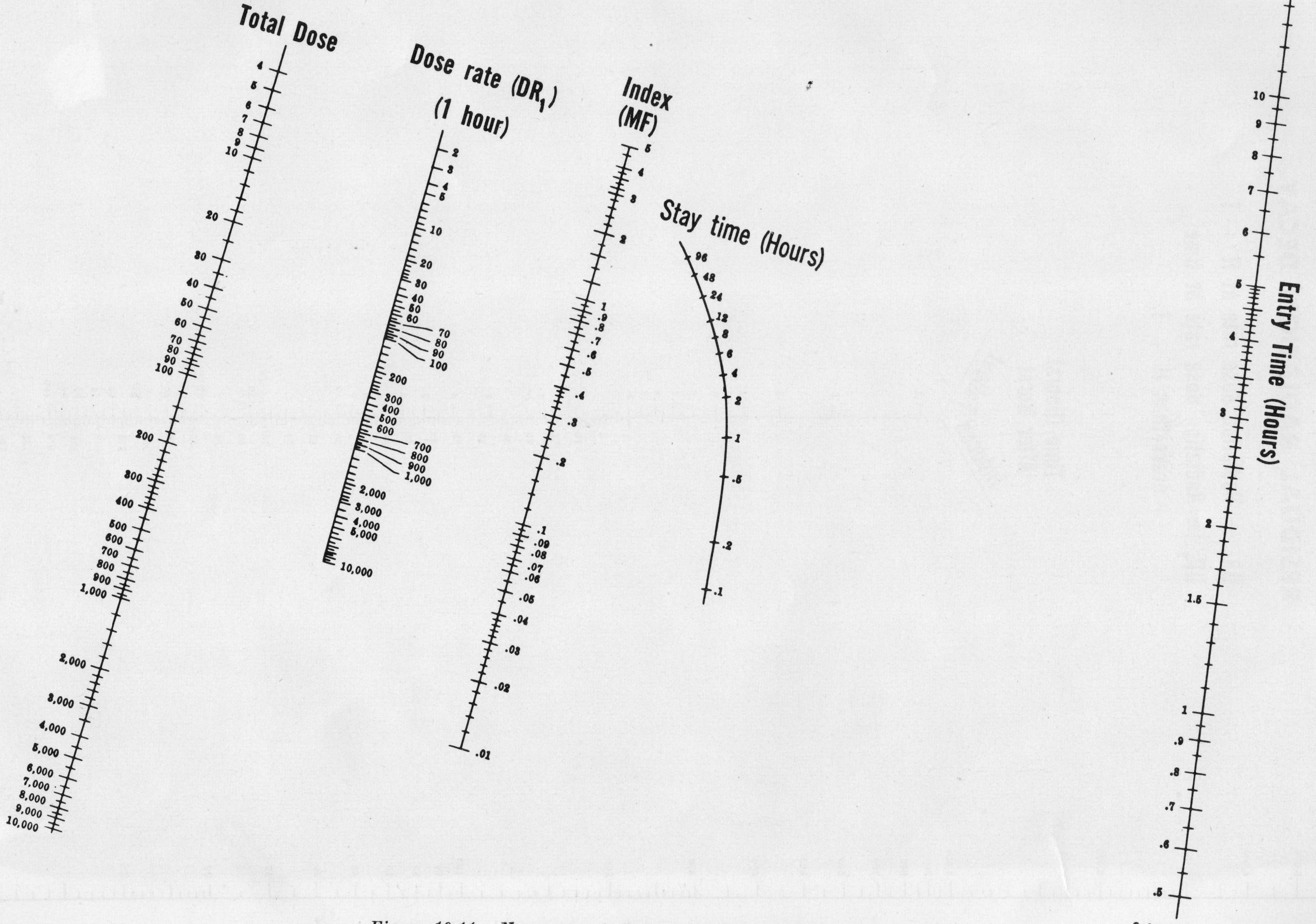


Figure 10.11. Nomogram 4, Determination of total dose (fallout).

Time for noneffectiveness	Total dose	
	Initial (rem)	Residual (r)
Immediate	5,000	5,000
1 hour	1,000	1,000
2 hours	750	600
4 hours	500	300
24 hours	300	150

Figure 10.12. Nuclear radiation criteria for casualties.

Environment	Initial		Residual
	Neutrons	Gamma	
Armored carrier	0.8	0.6	0.25
Urban area (in open)	1.0	0.5	0.8
Foxholes	0.25	0.1	0.2
Frame house			
First floor	1.0	0.7	0.5
Basement	0.7	0.4	0.1
Multistory buildings			
Top floor	1.0	0.7	0.5
Lower floors	0.7	0.4	0.1
Basement	0.5	0.25	0.01
Rough terrain	1.0	1.0	0.8
Shelter, closed (3 ft earth cover)	0.1	0.04	0.001
Tanks			
Light	0.7	0.33	0.15
Medium or heavy	0.5	0.15	0.05
Trucks			
¼-ton	1.0	1.0	0.8
2½-ton	1.0	0.9	0.6
Woods	1.0	1.0	0.8

Figure 10.13. Transmission factors for nuclear radiation—(ratio of protected to unprotected dose or dose rate).

Military Shelters

TECHNICAL MANUAL

Marconi
Radar Systems

CONCLUSIONS

It is obvious that this whole subject of EMP protection has far reaching consequences for everyone.

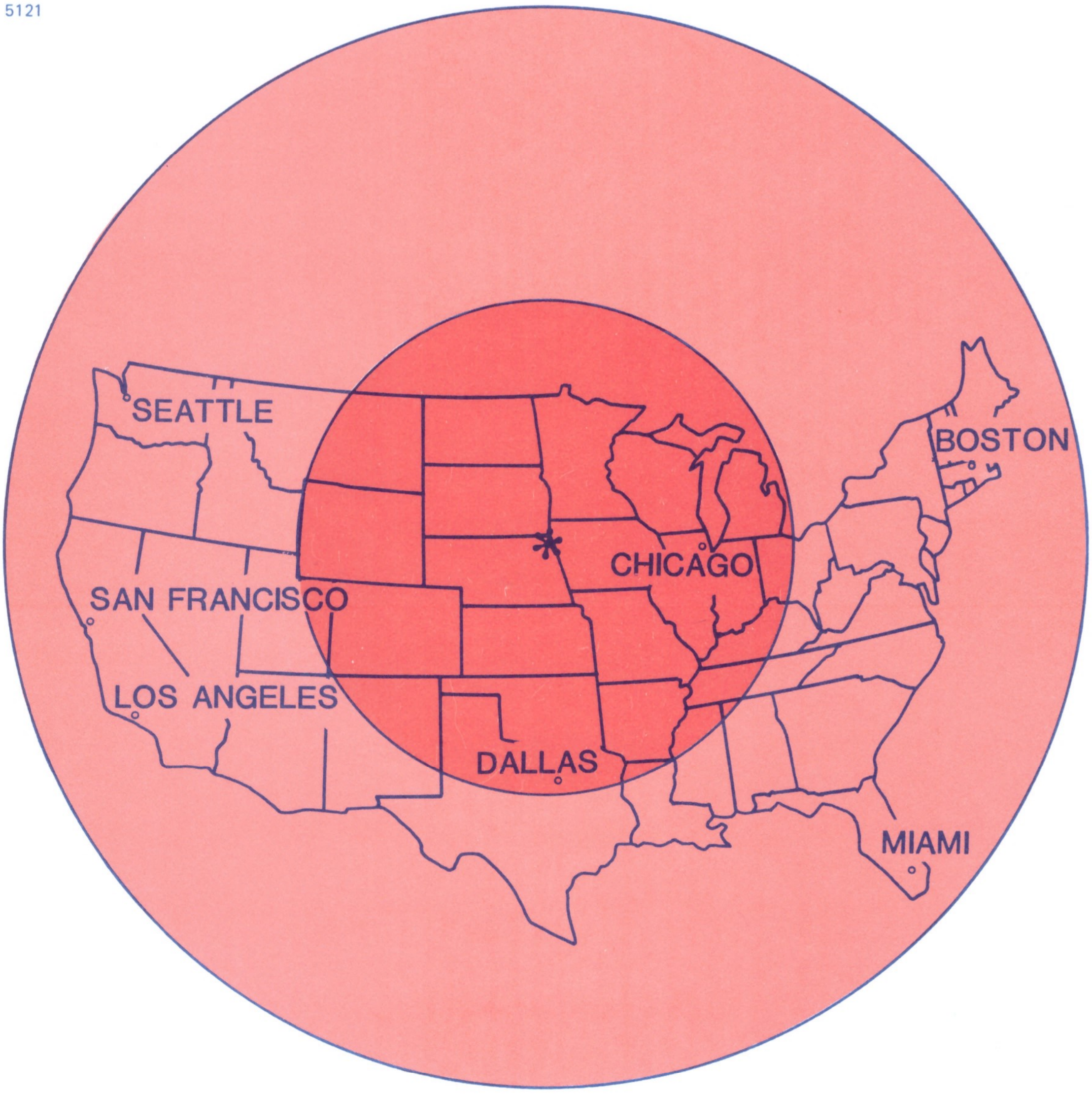
From what has been said so far, it can be seen that a deliberate detonation of a nuclear weapon to maximise the EMP effect could and probably would occur in any future conflict. This could affect countries not even involved in the conflict itself.

The probable effects of EMP exposure would mean telephone communications would be knocked out in most, if not all parts of the country. Landline and repeater equipment would be destroyed and rendered useless. Radio communications would be impossible, VHF broadcast receivers and mobile VHF equipment would be severely damaged. HF transmitter and receiver units would be useless, especially the widely used broadband radio and radar equipment. Mains power supplies would also be damaged.

In essence then, electronic communication and power supplies would cease to exist once an exo-atmospheric blast which produces a significant EMP has taken place. It is popularly supposed that this would be a temporary situation, but this is not the case and wide spread and immediate destruction of equipment would occur, which would take extensive repairs to correct. It is a sensible precaution to protect strategically important systems. The Marconi shelter range offers a cost-effective way of doing it.

E.M.P. blanket area for nuclear burst at 50 mile and 120 mile heights

5121



∗ POSITION OF NUCLEAR BLAST

INNER CIRCLE – COVERAGE IF DETONATED AT A HEIGHT OF 50 MILES

OUTER CIRCLE – COVERAGE IF DETONATED AT A HEIGHT OF 120 MILES

FIG. 560

One megaton burst over the North Sea

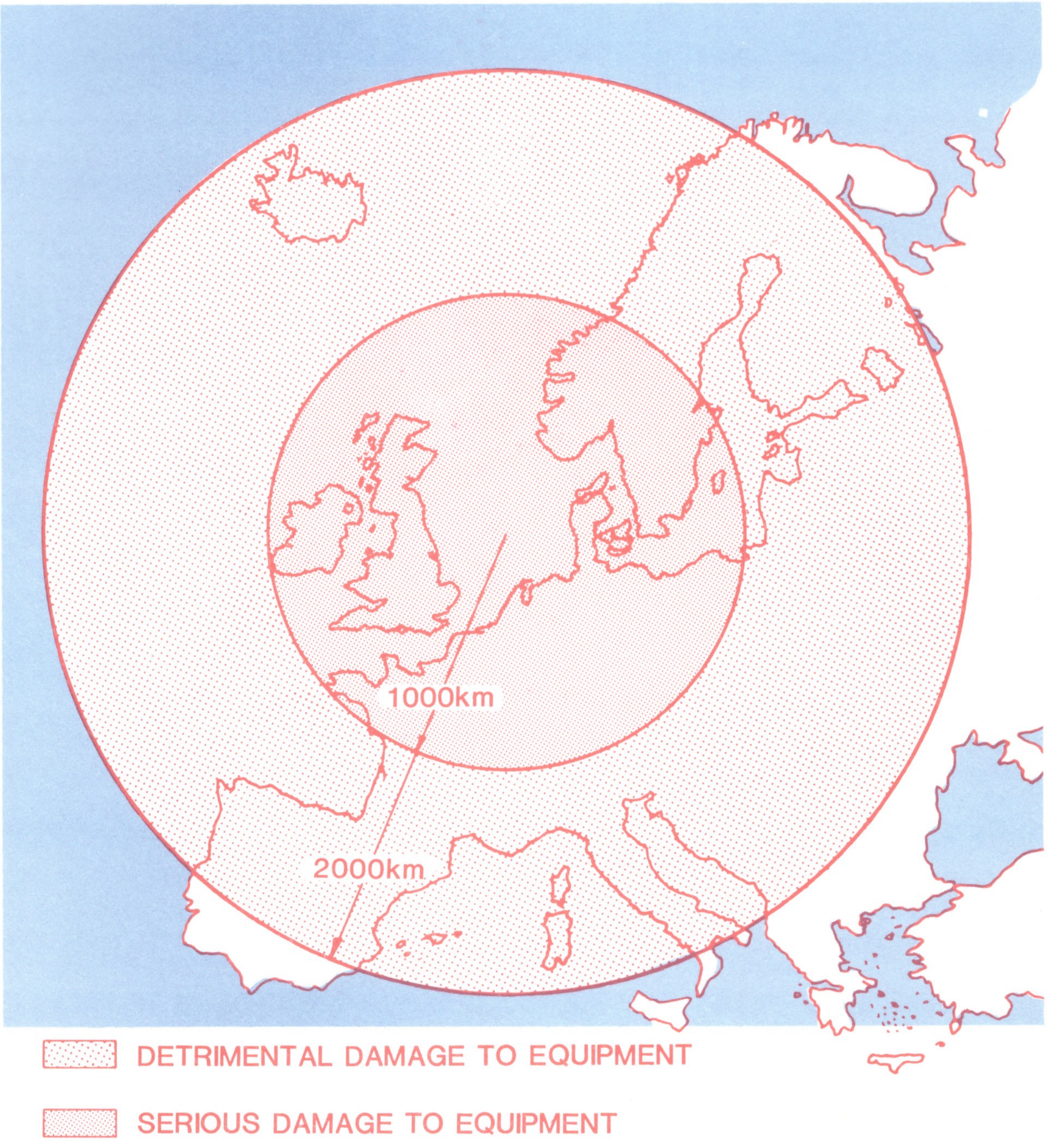


FIG. 550

E.M.P. energy collectors

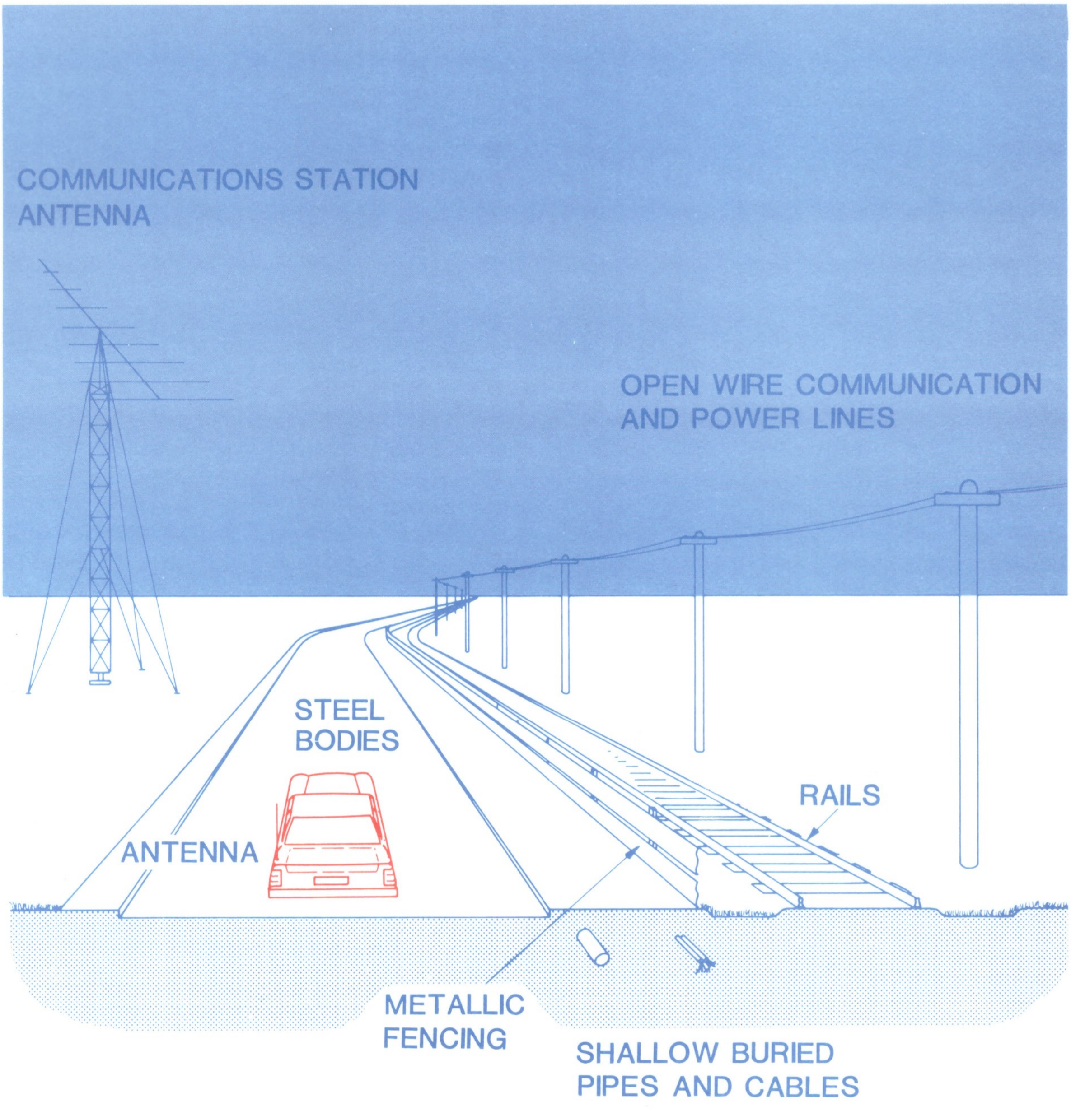


FIG. 590

Timescale of nuclear burst effects

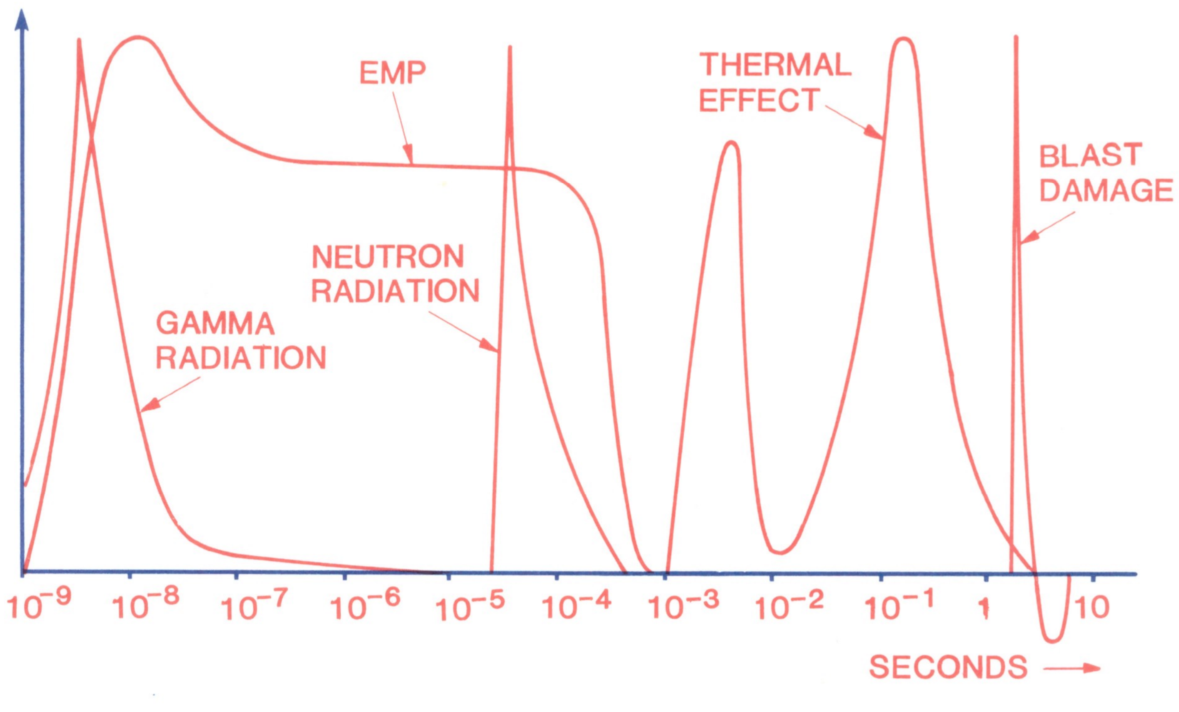


FIG. 510

Shelter A.C. supply

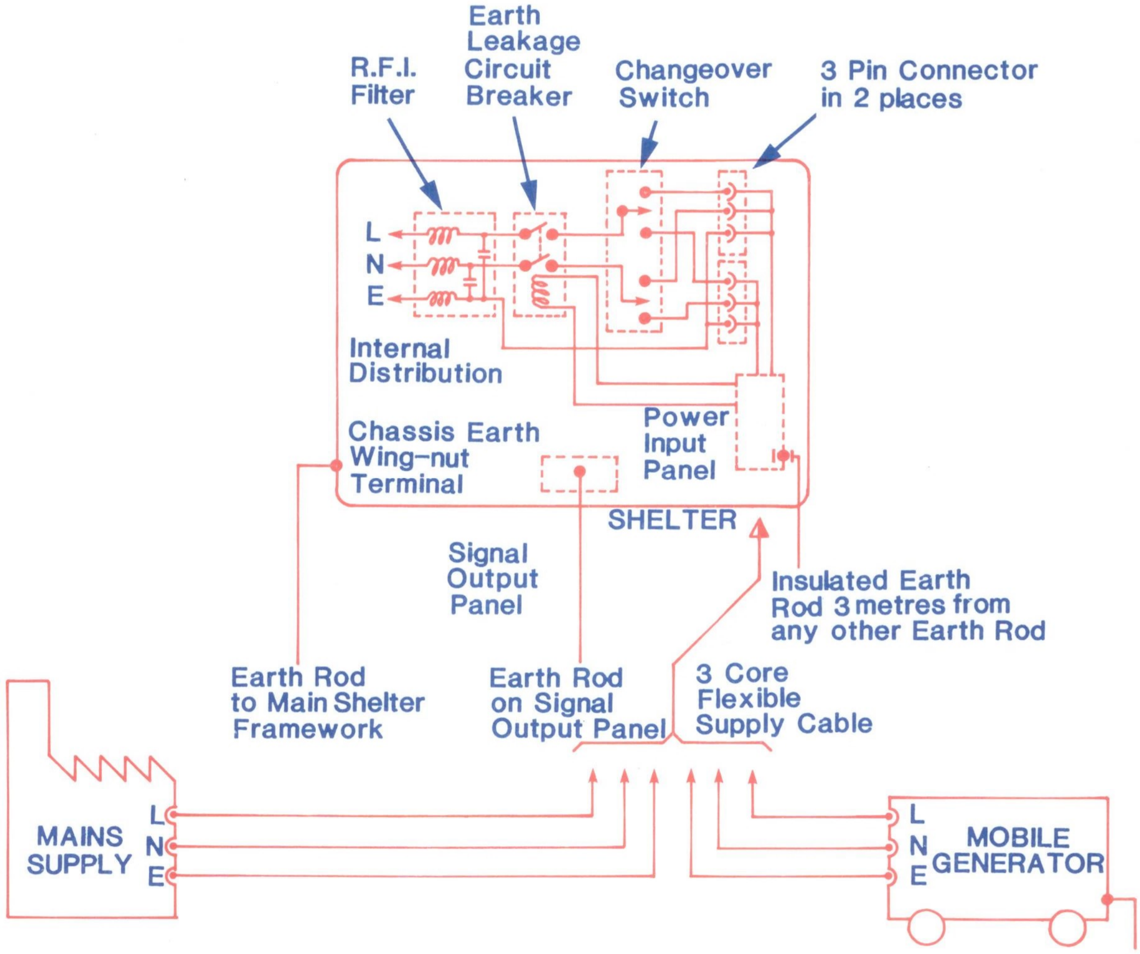


FIG.400

Shelter D.C. supply

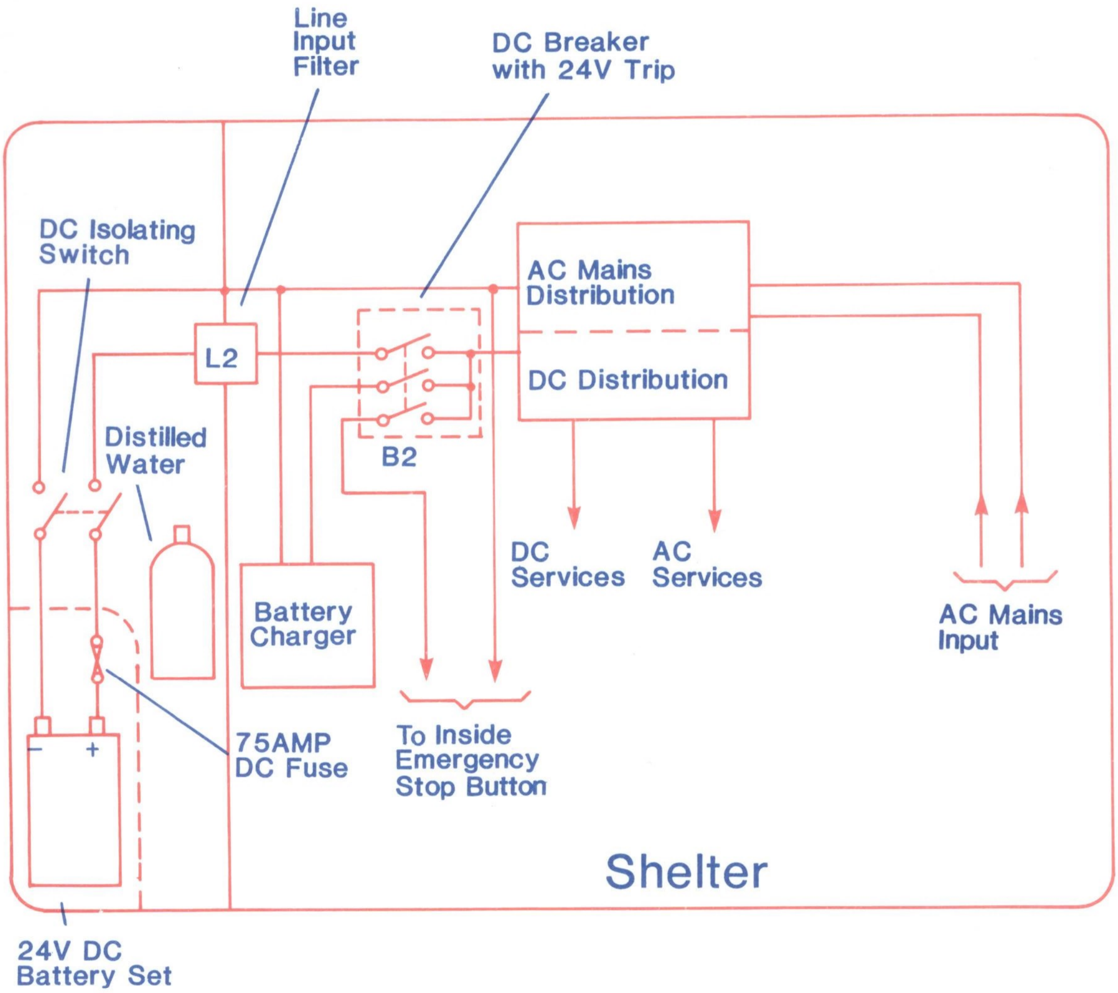


FIG. 410